Ph.D. Thesis

CURRENT DIAGNOSTIC, PHARMACEUTIC AND RECONSTRUCTIVE SURGICAL METHODS IN THE MANAGEMENT OF FACIAL NERVE PALSY

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II.Kecskes G, Jóri J, O'Reilly BF, Viharos L, Rovó L. Clinical assessment of a new computerised objective method of measuring facial palsy. *Clin. Otolaryngol*. 2011 Aug;36(4):313-9.

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III.Kecskes G, Jóri J, O'Reilly BF, Sztanó B, Viharos L, Kiss JG, Rovó L. A glasgow-i arcidegbénulás elemző skála – új, objektív értékelési lehetőség. *Fül-, Orr-, Gégegyógy*. 2010;56(4):156-163.

IV.Kecskes G, Herman P, Kania R, Salvan D, El Bakkouri W, Tran Ba Huy P, Sauvaget E. Lengthening temporalis myoplasty versus hypoglossal-facial nerve coaptation in the surgical rehabilitation of facial palsy: evaluation by medical and nonmedical juries and patient-assessed quality of life. *Otol Neurotol*. 2009 Feb;30(2):217-22

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IV. Fekete-Szabó G, Berényi I, **Kecskés G**, Madani S, Pozsár I, Bereczki Cs. Otogen abducens paresis gyermekkorban. *Fül-, Orr-, Gégegyógy.* 2007;53(3):125-129.

V. Fekete Szabó G, Berényi I, **Kecskés G.** Adenotómia elvégzése szemellenőrzés mellett. *Fül-, Orr-, Gégegyógy.*2007;53(1):30-33.

1 INTRODUCTION

1.1 The primary function of the facial nerve

Its primary function is to express voluntary behaviour and spontaneous emotions by moving muscles in the face. Damage to the facial nerve affects all muscles of the facial expression. Patients suffer serious functional, cosmetic and psychological problems, with impaired ability to communicate both verbally and non-verbally.

1.2 The facial nerve palsy-aetiology and pathophysiology

Facial nerve palsy could be temporary or permanent and could manifest itself in partial weakness to total paralysis of the mimic muscles. The grade of dysfunction depends on the aetiology, the localization and degree of the nerve injury. Trauma, herpes zoster oticus, polyneuritis, Borrelia, tumor, diabetes mellitus and surgery are known etiologic and/or concomitant factors involved in the disease.

1.3 Measurement of facial movements, the facial nerve grading systems

When assessing the function of the facial nerve, it is important to measure disability from the onset to various stages of recovery and to detect changes over time or after treatment. In the past few decades several, internationally accepted systems have been proposed by different authors, yet most of the existing grading systems are subjective. Due to the lack of objectivity, overall assessment of the facial function in a consistent manner has proven to be difficult.

1.4 New objective methods in the clinical practice for evaluating the facial nerve palsy

An objective international standardised method, which is easy to performed at a low cost and with a minimal requirement regarding time and equipments, can be a useful clinical tool to monitor clinical changes in subjects with facial palsy. The Glasgow Facial Palsy Scale (GFPS) is a recently developed, objective and quantitative assessment of facial palsy, developed by Brian O’Reilly et al.

1.5 Conservative management of facial nerve palsy

1.5.1 Bell’s palsy

Bell's palsy is the most common acute mononeuropathy and is the most common cause of acute facial nerve paralysis. The largest (18 trials involving 2786 patients) current systematic review and meta-analysis for pharmacologic treatment of Bell palsy concluded that corticosteroids effectively reduce the risk of an unfavourable outcome in Bell palsy.

1.5.2 Management of the eye

The most dangerous complication of facial nerve injuries is the paralysis of the orbicularis oculi muscle which may result in various ophtalmologic complications from simple ocular discomfort to the loss of vision. In case of temporary palsy the prior treatment is conservative and symptomatic such as ophthalmic drops and ointment, moisture chambers and taping of the lower lid into proper position or in case of severe lagophtalmus temporary lid loading using external weights can be useful.

1.6 Surgical management of the facial nerve palsy

1.6.1 Dynamic and static facial reanimation

Surgical rehabilitation aims at restoring the symmetry of the face not only during rest but also during emotional and voluntary motions such as smiling and eye closure. Different procedures of dynamic reanimation have been attempted, such as nerve transposition with the hypoglossal nerve or with the accessorius nerve; cross-face nerve graft that could be associated to the „babysitter” technique, muscle transposition (temporalis, masseter), and free muscle flap.

1.6.2 Reanimation of the eyelid function

Surgical intervention may be required for patients whose temporary palsy did not recover after several month and the eyelid closure is still not complete, who have failed the medical therapy and have ophthalmologic complications and in case of definitive palsy.

2 AIMS OF THE THESIS

2.1 Introduce a new diagnostic and therapeutic protocol

Our goal is to build a standard facial nerve palsy questionnaire which is available in everyday practice, simple enough for use in an ordinary Hungarian ENT department and covers the following areas:

1. Patient's data
2. Questions about aetiology and risk factors
3. Result of physical examinations and facial tests
4. Result of objective and subjective measurements to evaluate the grade of the palsy
5. Which treatment the patient received
6. Results of the regular follow-ups

At the same time we also set off to provide a new therapeutic protocol to standardize the treatment of the acute unilateral facial nerve palsy.

2.2 Introduce a new, objective facial grading system

The Glasgow Facial Palsy Score is a recently developed objective computerised method for the evaluation of the facial nerve function. By introducing this new facial grading system for the first time in Hungary, our objective was to compare the results obtained from this method with those obtained by traditional clinical methods accepted in different parts of the world.

2.3 Compare the different surgical methods of the facial reanimation in case of irreversible facial nerve palsy

The purpose was to compare end-to-end and end-to-side XII-VII coaptation with lengthening temporalis myoplasty in the rehabilitation of facial palsy. The results were graded by two different juries:, ear-nose-throat and plastic surgeons and a nonmedical jury.Both juries used the same four classic grading systems and other evaluations of the face. In addition, patients self-assessed their QOL after the surgery.

2.4 Introduce new management options in the treatment of paralytic lagophtalmus and ectropion

In the past decade the management of the lagophtalmus has significantly improved worldwide and the most popular and widely used static procedure is the upper lid gold weight implantation which can be coupled with lateral canthopexy in case of notable ectropion. The authors refer about their first experience with these two surgical methods in Hungary.

3 METHODS

3.1 Facial Palsy Questionnaire

In the current medical practice usage of protocols and questionnaires is becoming more and more common. At present in Hungary the evaluation and treatment methods of the facial nerve palsy are strongly dependent on the individual preferences and unique experience of the person the patient first meets.

I set out to develop a new protocol using my international experience as a baseline. My aim was to include in this protocol the following criteria: aetiology, risk factors, case history, result of the physical examination, facial test and grading system and treatment's options. The questionnaire also included a follow up section. The questionnaire was part of the separately created treatment protocol which was made available for all residents and nurses in the in-patient department. This protocol also helped our scientific work to compare the therapeutic outcome of the different patient populations.

3.2 Subjective and objective evaluation of facial nerve palsy

In the Facial Palsy Questionnaire I used three subjective and two objective staging systems to assess the grade of the facial palsy at the first examination and later on to measure the recovery at the regular follow-up visits.

3.2.1 Subjective facial nerve grading scales

The commonly accepted gross scale is the House-Brackmann Grading Scale (HBGS) which is the standard adopted by the American Academy of Otolaryngology Head and Neck Surgery. It requires the subject to perform a series of movements which are clinically assessed and subjectively assigned to an overall grade from Grade I (normal) to Grade VI (no movement).

The Yanagihara Grading Scale (YGS) is the standard method used in the Japanese literature. It is obtained by the subjective assessment of total symmetry at rest and nine different facial movements using a three step grading (0-2-4) which when summated gives a scale from 0 (total paralysis) to 40 (normal).

The Sunnybrook Grading Scale (SBGS) is a composite score from the subjective assessment of resting asymmetry (0 to 2) in three regions with the sum multiplied by five, the voluntary excursion during five standard movements (1 to 5) with the sum multiplied by four and assessment of any synkinesis associated with the same voluntary movements (0 to 4) and summed. The final score is produced by subtracting the asymmetry and synkinesis scores from the voluntary movement score giving a scale from 0 to a normal result of 100.

3.2.2 Objective facial nerve grading scales

The Stennert-Limberg-Frentrup Scale (SLFS) is commonly used in the German literature and has separate scores for paralysis and secondary defects. The paralysis score is obtained by a combination of comparisons with the normal side of the resting tone in the four regions of the face plus comparisons of six motility assessments during voluntary movements each with score of 0 for similar and 1 for significantly worse than the normal side. Added together a result of 0 is normal and 10 a total paralysis. The secondary defect score is obtained by assessing the presence or absence of seven separate symptoms.

3.2.3 Glasgow objective facial nerve grading system

The Glasgow Facial Palsy Scale (GFPS) is a recently developed objective method of measuring both the House-Brackmann grading and the movement in the different regions of the face. A computer programme is used to automatically measure the pixel changes in both sides of the face produced during 5 standard movements: raise eyebrow, close eye gently, close eye tightly, screw-up nose and full smile. Specially trained Artificial Neural Networks are then used to assess the relationship of the pixel changes to the clinical grading of not only the House-Brackmann overall function but also the function in the different regions of the face. By using this system it is possible to produce a consistent objective measurement of the overall House-Brackmann grading and also the movement of the different regions of the face. For ease of interpretation in a clinical setting the results are presented in a form similar to an audiogram with the regional standard movements rather than frequencies along the x axis and the degree of palsy rather than decibels on the y axis. A Facogram graph can then be produced in a similar time taken to produce an audiogram.

3.3 Study population

3.3.1 Glasgow Facial Palsy Scale

Over a six month period 40 consecutive subjects with a unilateral facial palsy attending a tertiary referral clinic were recruited for testing. The subjects were 28 females and 12 males aged between 8 and 82 years with a mean age of 52. Aetiologies of the facial palsies were the following: Bell's palsy (n=29), postoperative palsy (n=6), Ramsay-Hunt syndrome (n=4), temporal bone fracture (n=1).

3.3.2 Facial reanimation

42 patients underwent reanimation surgery for facial palsy from 1998 to 2005 in the Lariboisiere Hospital in Paris. Patients had complete and irreversible facial palsy largely secondary to cranial base surgery or secondary to middle ear cholesteatoma surgery, parotid tumor extirpation, or temporal bone fracture. The cause was idiopathic in one case.

3.3.3 Lateral canthopexy and upper lid gold weight implant

Between July 2009 and December 2009 we performed lateral canthopexy and upper lid gold weight implantation on three patients.

All patients had postoperative facial nerve palsy. Two patients had total parotidectomy with the resection of the facial nerve because of malignant parotid tumour. The third patient was operated twice with recidive pleimorpf adenoma.

3.4 Surgical techniques

3.4.1 Hypoglossal-facial nerve anastomosis

All surgical procedures were performed by 3 senior head and neck surgeons with a broad experience in the management of facial palsy rehabilitation. Facial rehabilitation involved XII-VII coaptation (n = 32) by either classic end-to-end (n = 16) or end-to-side coaptation with interpositional jump graft (technique of May et al. ; n = 16).

3.4.2 Temporalis myoplasty

Indications for lengthening temporalis myoplasty (Labbe technique; n = 10) were a facial palsy occurring after parotid tumor extirpation or for the long-standing facial palsy.

3.4.3 Eyelid reanimation

Lateral canthopexy and upper eyelid gold weight implant was performed in local infiltration anaesthesia. Subciliary incision was made for the canthopexy and the pre-existing eyelid crease 3-4 mm from the upper lid margin was incised for the gold weight implantation.

3.5 Evaluation

3.5.1 GFPS versus classical grading systems

3.5.1.1 Medical jury

The videos were then also individually assessed by three independent ENT Specialists (Drs K.G., R.L: and SZ.B.) who graded each subject using the subjective House-Brackmann Grading Scale, Yanagihara Grading Scale and Sunnybrook Grading Scale and the objective Stennert-Limberg-Frentrup Scale.

3.5.1.2 Statistical analysis

A One-sample Kolmogorov-Szmirnoff test was applied to assess the presence of a normal distribution. The Pearson correlation coefficient was measured in the presence of a normal distribution and the Spearman correlation coefficient measured in the presence of an abnormal distribution (Statistica 8.0 software). In both methods the linear correlation coefficient (r) measures the strength and direction of any relationship between the two variables**.**

3.5.2 Facial nerve reanimation surgery

3.5.2.1 Medical and non-medical jury

For the evaluation of the results of surgery, a video of the patient was recorded with the face at rest, during voluntary motion of the 10 groups of facial muscles, during expression of the 6 main emotions (happiness, sadness, anger, disgust, surprise, and fear), and during a short free conversation that allowed evaluation of spontaneous expression. Medical (three ear-nose-

throat and two plastic surgeons) and nonmedical juries (a cameraman, a filmmaker, an esthetician, and an artist painter) then evaluated the recording.

3.5.2.2 Patient's evaluation

2 well-established questionnaires, the Facial Disability Index (FDI) and the Glasgow Benefit Inventory (GBI), as well as a Quality of life (QOL) questionnaire developed in our institution, was sent to each patient

3.5.2.3 Statistical evaluation

ANOVA and Fisher's exact test were used to analyze the relationship between facial palsy duration and quality of recovery. Treatment effects were compared by the lapse time between the surgical procedure and the initial evidence of recovery, scores on the 5 grading scales, and the other scores given by the medical and nonmedical juries and the self-assessment by the patients.

3.5.3 Eyelid reanimation

Statistical analysis is planned when the study population reaches at least 15 patients.

4 RESULTS

4.1 Comparison between Glasgow Facial Nerve Palsy scale and four classical, widely used objective and subjective facial grading scales

The House-Brackmann Grading Scale data was not normally distributed and had a Spearman's coefficient of 0.64 which indicates an averagely strong correlation between the Glasgow Facial Palsy Scale and the House-Brackmann Grading Scale assessments.
The other standard clinical methods of assessment had a normal distribution with a Pearson's coefficient between the Glasgow Facial Palsy Scale and Sunnybrook Grading Scale of 0.7 and between the Glasgow Facial Palsy Scale and Stennert-Limberg-Frentrup Scale of 0.65, both showing an averagely strong correlation. The correlation between the Glasgow Facial Palsy Scale and Yanagihara Grading Scale was the strongest with a Pearson coefficient of 0.72**.**
There was a low interobserver variation for all the scales apart from House-Brackmann. The reason for this is likely that this scale has the lowest number of options available when making the subjective decision on the degree of the palsy.

4.2 Comparison of different types of hypoglosso-facial nerve anastomosis and temporalis myoplasty

4.2.1 General Characteristics of the Population

Mean age did not differ between the groups (45.7±15.8 yr for the coaptation group versus 51.7±17.7 yr for the myoplasty group; p = 0.26), nor did sex distribution differ (p = 0.41). Mean delay for detecting the first signs of recovery did not significantly differ between the myoplasty group (2±1.1 mo) and the end-to-end coaptation group (5.2±3.5 mo) but it was significantly longer for the end-to-side coaptation group (9.5±6.9 mo; p= 0.017). Approximately half the patients underwent facial physiotherapy after surgery.

4.2.2 Evaluation by the Medical Jury

The medical jury rated end-to-side coaptation significantly better than myoplasty by the Sunnybrook grading system (p = 0.03) and end-to-end coaptation better than myoplasty by the Freyss and Yanagihara grading systems (p = 0.018 and p = 0.024, respectively). The jury rated both end-to-end and end-toside coaptation better than myoplasty by the HBGS (p = 0.037 and p = 0.026, respectively). For the face at rest the score for either coaptation type was

not significantly different from that for myoplasty (6.8/10 versus 5.4/10). For the face during voluntary motion, the mean score for all procedures was 4.9/10 and during expression of emotions was 4.8/10 with no significant difference between groups ($p = 0.91$).

4.2.3 Evaluation by the Nonmedical Jury

For the face at rest, the score was significantly higher for the end-to-end and end-to-side coaptation groups than for the myoplasty group (7.7/10, 7.9/10, and 5.6/10, respectively; $p = 0.004$ and $p = 0.001$). The jury noted that disharmony of the face was more obvious for the myoplasty group and that voluntary motions were stronger with both coaptation groups than with the myoplasty group (5.8/10, 6/10, and 4.7/10, respectively; $p = 0.02$ and $p = 0.006$). The jury ranked the expression of emotions between 6/10 for the end-to- end coaptation group and 4.7/10 for the myoplasty group, with a significant difference between these two groups ($p = 0.02$).

4.2.4 Patient Evaluation

All patients felt less disabled after surgery than before with respect to physical and social impairment, but patients still had some complaints. Indeed, the mean score of the FDI was 56/100±27.5 for the physical portion and 69/100±23 for the social portion, with no significant difference according to procedure.

The GBI results showed a net improvement regardless of procedure (mean score = + 12±20 [max, + 50; min,-50]). On our institution's questionnaire, patients considered that their daily and professional lives were significantly improved ($p < 0.001$ and $p < 0.02$, respectively. In most cases, patients were satisfied, would consent to surgery again, and thought that surgery had been useful.

4.2.5 Prognostic Factors

For each surgical procedure, the time between the onset of the facial palsy and the rehabilitation procedure did not influence the functional results by the HBGS.

4.2.6 Comparison of the Grading Systems

No significant difference was found in scores between the 4 grading systems.

4.3 Gold eyelid weight and lateral canthopexy

In every case perioperative eyelid oedema and haematoma has appeared which has been dispersed in few days with the use of topically applied corticosteroid and antibiotic. Perfect eyelid closure was observed 14 days after the upper eyelid gold weight implantation.

5 DISCUSSION

5.1 Comparison between Glasgow Facial Nerve Palsy scale and four classical, widely used objective and subjective facial grading scales

5.1.1 Synopsis of key findings

There is a moderately strong correlation between the Glasgow Facial Palsy Scale and House-Brackmann Grading Scale which is to be expected as the artificial neural networks used to produce the Glasgow Facial Palsy Scale are trained with House-Brackmann Grading Scale results assessed by clinicians. The strongest relationship was found between the Glasgow Facial Palsy Scale and Yanagihara Grading Scale which underlines the detailed regional information measured in both systems. The Glasgow Facial Palsy Scale showed a strong correlation with the Sunnybrook Grading Scale and a moderately strong correlation with Stennert-Limberg-Frentrup Scale demonstrating the sensitivity of this objective method when assessing overall facial nerve function.

5.1.2 Study strengths and weaknesses

The Glasgow Facial Palsy Scale is an objective quantitative evaluating method based on the computer analyses of pixel changes during a digital video recording of facial movements thereby eliminating the subjectivity of the observer. The process is quick and has modest technological requirements using a basic laptop computer and a domestic digital video camera. The program is available on the web as open source software. The facogram which is produced automatically demonstrates the individual regional facial nerve functions and can be stored electronically or in a printed form in the case record.

Its drawbacks are that it does not evaluate secondary defects such as synkinesis or tearing but it could be supplemented by simultaneous use of the Stennert's secondary defect score. As the paralyzed side's movement is compared to that on the normal side it cannot be performed in presence of bilateral palsy. The identification of the different regions relies on a normal position of the pupils therefore it cannot be used in the presence of strabismus, oculomotor palsy or an artificial eye.

5.2 Comparison of different types of hypoglosso-facial nerve anastomosis and temporalis myoplasty

We aimed to compare the results of end-to-end and end-to-side XII-VII coaptation and lengthening temporalis myoplasty as assessed by an expert jury using the four most accepted facial grading systems, by a nonmedical jury and by the patients' own QOL assessments. Regardless of the evaluator XII-VII coaptation, whatever the type, gave better results than myoplasty. End-to-end coaptation gave better muscle tone but stronger synkinesis than end-to-side coaptation. Similarly, patients also experienced improvement regardless of the procedure used.

XII-VII coaptation, whatever the type, yielded significantly better results than myoplasty, regardless of grading systems used by the medical jury and scores given by the nonmedical jury. The most significant and discriminating factor of the myoplasty procedure was an obvious disharmony of the lower face caused by the visibility of the nasolabial scar, the inescapable overcorrection of the superior lip, and the absence of inferior lip rehabilitation which led to a deviation of the inferior lip toward the healthy side. However, the medical jury rated the smile more spontaneous with myoplasty than with XII-VII coaptation.

End-to-end coaptation leads to high motility, but also adverse effects, such as synkinesis and mass movements. In contrast, end-to-side coaptation leads to a weaker muscle tone, less synkinesis and mass movement and longer recovery because of axonal loss and fibrosis due to the presence of secondary coaptation.

Patient QOL was improved in general, regardless of the technique, meaning that rehabilitation was guaranteed. However, the scores from the three patient questionnaires were moderate, so rehabilitation was not perfect. Interestingly, these questionnaires could not discriminate between the effects of XII-VII coaptation and myoplasty.

Surprisingly, we found that results with the different grading systems were comparable with nonmedical jury evaluations, showing that XII-VII coaptation led to better results than myoplasty. However, these grading systems are not perfectly adapted for the evaluation of facial reanimation, because secondary healing defects such as synkinesis and mass movements are not well described: forehead motility is evaluated, but it is never reanimated and no system evaluates emotional motions.

5.3 Comparison between lateral tarsorraphy and upper lid gold weight implant in the treatment of paralytic lagophtalmus

Restoration of the eyelid animation and aesthetics are the major component of surgical management of long-term facial nerve palsy. Tarsorraphy has been the traditionally used method in Hungary because of its simplicity. However, besides limiting the vision and offering an insufficient corneal coverage, the procedure may lead to unappealing cosmetic effects. Following the release of the tarsorraphy notching of the eyelid margin or ectropion may occur.

The gold eyelid weight introduced 60 years ago by Sheehan et al is the most widely applied surgical method internationally. Gold weights can be safely implanted in an outpatient setting with local anesthesia. This easy and effective method has also the advantage of being reversible without leaving any defects, thus can also be used for patients with temporary palsy. It reanimates only the paralyzed upper lid; therefore it should be completed if necessary with a lower lid tightening procedure, as it was previously described. To obtain a good result adequate preoperative evaluation is compulsory to determine the optimal size, weight and position of the implant. Custom-made weights are far cheaper and produce a much more aesthetic result than commercially manufactured gold implants. Complications like infection or allergic reaction can occur but have been found infrequent. Possible long-term complications are the following: upper eyelid pseudoptosis, under correction, migration, extrusion and astigmatism due to nonconformity of gold weight to the corneal slope.

Most of the possible complications can be avoided by proper surgical techniques and a good understanding of periocular anatomy. In our study no complication occurred.

To restore the maximal eyelid function in addition to the upper eyelid weight implant the management of lower lid drooping is crucial as well. When the patient cannot afford the price of the gold weight and have only a small problem of occlusion, canthopexy alone can be considered as the primary intervention. Merely the tightening of the lower lid can already enhance the occlusion. Evidently gold weight lid loading can be always performed later on if necessary.

In our interventions we opted not to use the commercially available implants due to their high costs, and the sometimes cumbersome and expensive ways of importing them to Hungary. Instead we used customized 99,99% pure gold implant manufactured by a private jeweller.

6 CONCLUSIONS AND NEW RESULTS

6.1 Glasgow Facial Palsy Score

The most common situation for a clinician wishing to measure and record facial weakness is the clinical monitoring of Bell's palsy. This objective programme is ideal for this and also applicable when comparing results of treatments in double blind trials and in the clinical audit of skull base surgery. The authors are preparing a new study to monitor clinical changes in subjects with facial palsy by comparing the results obtained from the objective computerised method with the results obtained by the standard subjective clinical methods of the House-Brackmann Scale, Yanagihara, Sunnybrook grading scales and the objective clinical Stennert-Limberg-Frentrup scale.

6.2 Facial reanimation methods

Fully restoring facial function and emotions after facial palsy remains challenging. The choice of the appropriate surgical rehabilitation procedure must rely on a detailed analysis comprising the facial palsy duration, the cause of the facial palsy, the presence of other cranial nerve injuries, the spontaneous expression of the healthy side, and the motivation of the patient. We suggest that XII-VII coaptation should be preferred over temporalis myoplasty for facial palsy whenever possible because it provides better results with the face at rest, but motions with both procedures are comparable.

6.3 Eyelid reanimation in facial nerve palsy

As the funtional and cosmetic results of the combination of gold eyelid weight and lateral canthopexy significantly surpass those of the lateral tarsorraphy this should be the primary treatment in case of paralytic lagophtalmus. Customized gold eye weights offer a good and lot cheaper alternative against commercially available ones.

6.4 New results

The conclusion of our paper on the current diagnostic, pharmaceutic and reconstructive surgical methods in the management of facial nerve palsy is that there is a huge demand for a facial nerve palsy protocol to compare the results of different workgroups and methods. The international literature available on this topic reflects the same problem: different patient

groups are evaluated and treated with different methods so metaanalysis of the results is not possible. In an attempt to address this gap during our work:

- We have introduced a suitable complex questionnaire containing aetiology, risk factors, case history, result of the physical examination, facial test, different subjective and objective measurements and treatment options.
- We have established a new therapeutic protocol to standardize the treatment of the acute unilateral facial nerve palsy.
- For the first time in Hungary, we used a new, quick, objective, quantitative method – the Glasgow Facial Palsy Score – which could be easily applied to daily clinical routine (II,III).
- Based on my foreign clinical experience and derived from the surgical results of our French colleagues we compared three different facial reanimation techniques (IV).
- For the first time in Hungary, we introduced and accomplished the use of simple surgical methods already proven abroad for the treatment of lagophtalmus and ectropion secondary to facial nerve palsy (I).

6.5 Future

For the future we have the following ideas to realize:

- We would like to develop a new facial palsy score with which the results of the facial reanimation could be also analysed.
- We would like to continue to perform eyelid reanimation surgery and do statistical analysis of our long-term results

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